

Crop Residue Management and Tillage System Effect on Bed Height, Ground Cover, Corn Grain Yield and Net Returns in a Soybean/Corn Rotation



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Table 1. March ground cover in 2012-2014, Verona and Stoneville, MS.

Treatment	Verona				Stoneville		
	2012	2013	2014		2012	2013	2014
			Burn	No-burn			
NT	87 a ¹	89 a	88 aA ²	88 aA	66 a	61 a	65 a
BR	42 c	47 c	40 cB	60 bA	14 c	16 c	12 c
TT	67 b	59 b	59 bA	64 bA	36 b	35 b	52 b
Disk (2X) + TT	33 d	30 d	37 cB	66 bA	15 c	17 c	21 c

¹Numbers in a column with the same lower case letters are not significantly different at the 5% probability level.

²Numbers across columns with the same upper case letters are not significantly different at the 5% probability level.

Table 2. March bed heights in 2012-2014, Verona and Stoneville, MS.

Treatment	Verona			Stoneville		
	2012	2013	2014	2012	2013	2014
NT	2.8 d ¹	2.9 c	1.9 d ²	2.1 c	1.7 b	1.5 c ²
BR	5.9 a	6.6 a	6.9 a	5.0 a	4.4 a	6.4 a
TT	4.7 b	4.9 b	5.1 b	3.0 c	1.7 b	2.5 b
Disk (2X) + TT	3.7 c	2.5 d	3.1 c	3.7 b	0.5 c	0.6 d

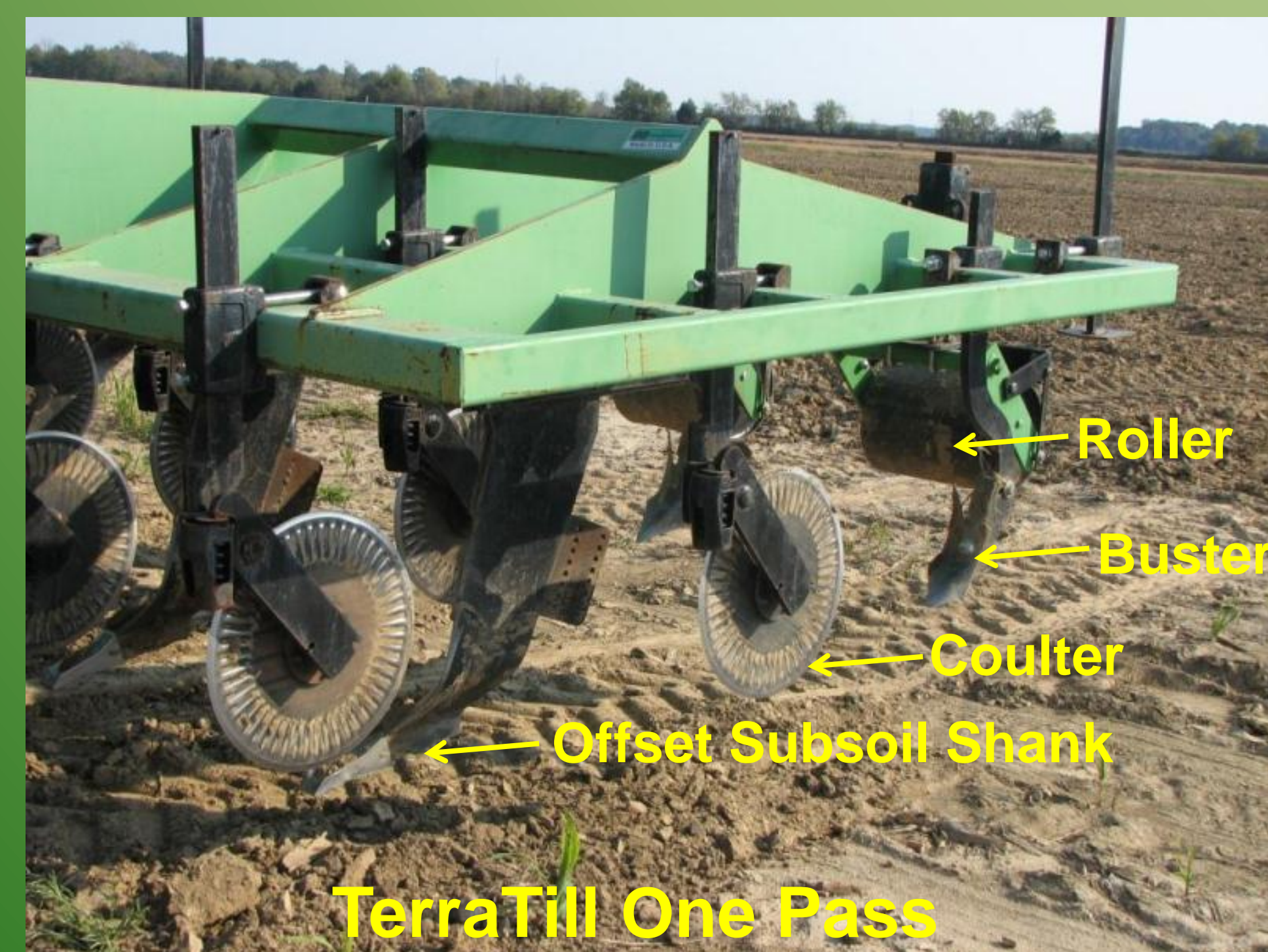
¹Numbers in a column with the same letters are not significantly different at the 5% probability level.

²Bed height prior to reshaping beds with a bed-roller.

Table 3. Corn net returns above total specified cost in 2012-2014, Verona and Stoneville, MS.

Tillage	\$/acre					
	Verona			Stoneville		
	2012	2013	2014	2012	2013	2014
NT	914 c ¹	323 b	469 b	614 a	418 a	252 b
BR	974 b	307 b	460 b	480 a	380 a	288 a
TT	1143 a	400 a	518 a	555 a	424 a	260 ab
D + TT	1133 a	384 a	463 b	500 a	403 a	242 b

¹Numbers in a column with the same letter are not significantly different at the 5% probability level.



Objectives

Determine long term corn and soybean residue management and tillage in furrow irrigated and non-irrigated environments effect on:

- Bed height, spring ground cover (crop residue and new vegetation) and yield.
- The returns above total specified expenses.

Materials and Methods

The experimental design was a split plot with 4 and 6 replications at Verona (non-irrigated) and Stoneville (irrigated), respectively. The soil types were Marietta loam at Verona and a Boskett/Dubbs fine sandy loam at Stoneville. For each location, crop residue management [burn (corn only) and no crop residue burn] was the main plot treatments. The subplot treatments of annual fall tillage systems were no-tillage (NT) on old beds, bed-roller (BR), TerraTill (TT) (TerraTill®, one pass subsoil-bed-roller operation, Bigham Ag, Lubbock, TX.) and disk (2X) + TT (D+TT). Since soybeans produce low residue amounts, no soybean crop residue was burned. Crop residue management and tillage treatments were on the site for the duration of the study (2011-2016). Data was analyzed using PROC GLIMMIX (SAS 9.2) procedure.

Results and Discussion

Crop Residue Management:

- Except for March ground cover, crop residue management had no effect on bed height, grain yield and net returns.

March Ground Cover (Table 1):

- No-tillage at both locations had more ground cover (old crop residue and vegetation) than all other tillage systems.
- In 2012 and 2013 at both locations and 2014 at Stoneville, TerraTill ground cover was lower than no-tillage but higher than bed-roller and disk (2X) + TerraTill.
- In 2014 at Verona, there was a crop residue management interaction. No-tillage and TerraTill indicated no difference between burn and no burn. However, bed-roller and disk (2X) + TerraTill had lower ground cover with the burn than no burn.

March Bed Heights (Table 2):

- In this study, after 2 years (2012 and 2013) with no-tillage production on old beds, the bed height was less than 2 inches and were reshaped in the spring of 2014 at both locations.
- TerraTill bed heights at both locations were lower than bed-roller but higher than the disk (2X) + TerraTill, except 2012 at Stoneville where TerraTill bed height was lower than disk (2X) + TerraTill.

Yield (Figures 1, 2 & 3):

- Verona (non-irrigated):** All 3 years (2012-2014), TerraTill and disk (2X) + TerraTill yields were not different but higher than no-tillage. TerraTill yield was higher than bed-roller all 3 years. Disk (2X) + TerraTill was only higher than bed-roller 2 of 3 years.
- Stoneville (irrigated):** Two (2012-2013) of 3 years no-tillage and bed-roller yields were equal to TerraTill and disk (2X) + TerraTill.

Net Returns (Table 3)

- The economic analysis included in this study is based on enterprise budgeting of net returns above total specified expenses. Returns above total specified expenses are used as a proxy for the economic concept of net returns above variable plus fixed costs. The net returns per acre were based on the average reported price for the week of the research plot harvest date (USDA Market News-JK_GR110). The corn prices for both locations in 2012, 2013 were \$7.12 and \$4.27, respectively, and \$3.46/bu, (Stoneville) and \$3.70/bu (Verona) in 2014. Direct and fixed expenses priced were taken from Mississippi State University Budgets (MSU Department of Agricultural Economics Budget Report 20123-05). Some items were intentionally left out of these cost calculations, i.e., costs for land or land rent, taxes, insurance premiums, general farm overhead, and expected incomes from government payments or insurance payments as they vary widely between operations.
- Verona (non-irrigated):** TerraTill net returns were higher than disk (2X) + TerraTill 1 of 3 years and higher than no-tillage and bed-roller all 3 years.
- Stoneville (irrigated):** Two of 3 years there were no net return differences between tillage systems. In 2014 bed-roller had higher net returns than no-tillage and the disk (2X) + TerraTill; and was equal to TerraTill.

Conclusions

- All 3 years the disk operations at both locations did not increase net returns above TerraTill alone.
- In an irrigated environment (Stoneville), the TerraTill and disk (2X) + TerraTill did not increase net returns or show an economic benefit.
- In a non-irrigated environment TerraTill consistently had higher yields and net returns than no-tillage and bed-roller.
- No-till production on old beds can be achieved successfully on loam/fine sandy soils for about 2 years.

Future Research

Evaluate the TerraTill one-pass system in an irrigated environment with soil moisture sensor technology to determine whether in-row sub-soiling would extend the intervals between irrigations.

Fig. 1. 2012 Corn Yield at Verona and Stoneville, MS.

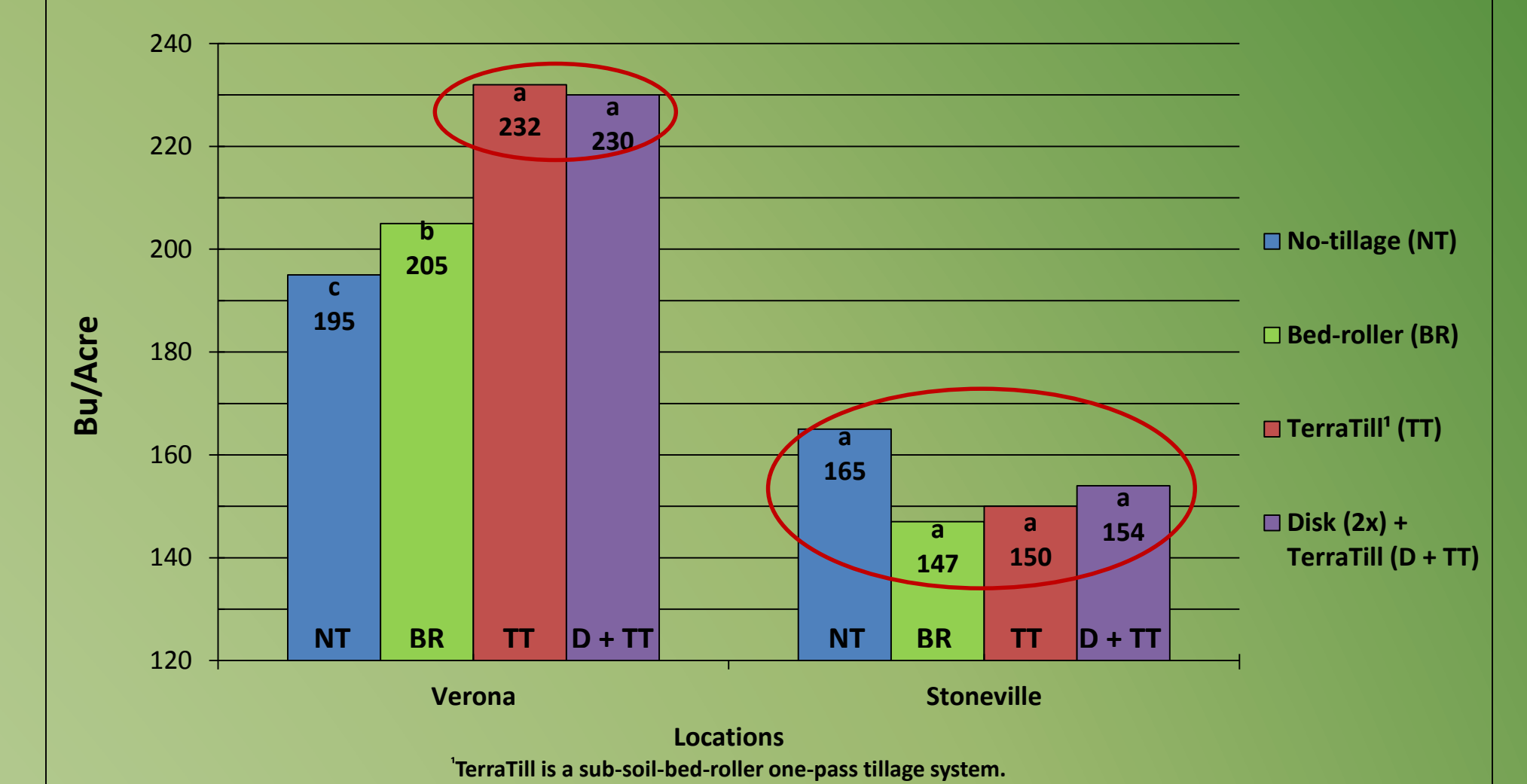


Fig. 2. 2013 Corn Yield at Verona and Stoneville, MS.

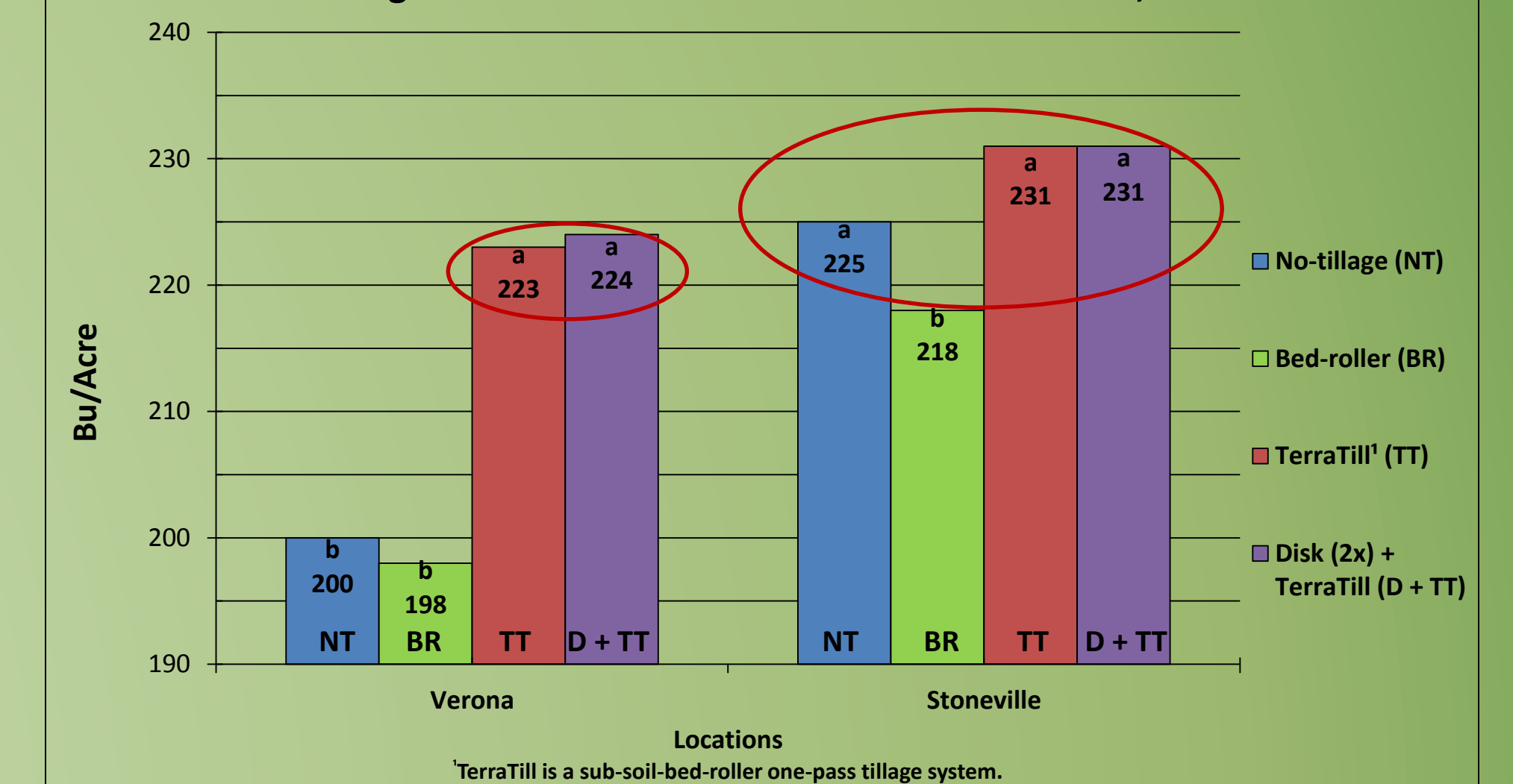
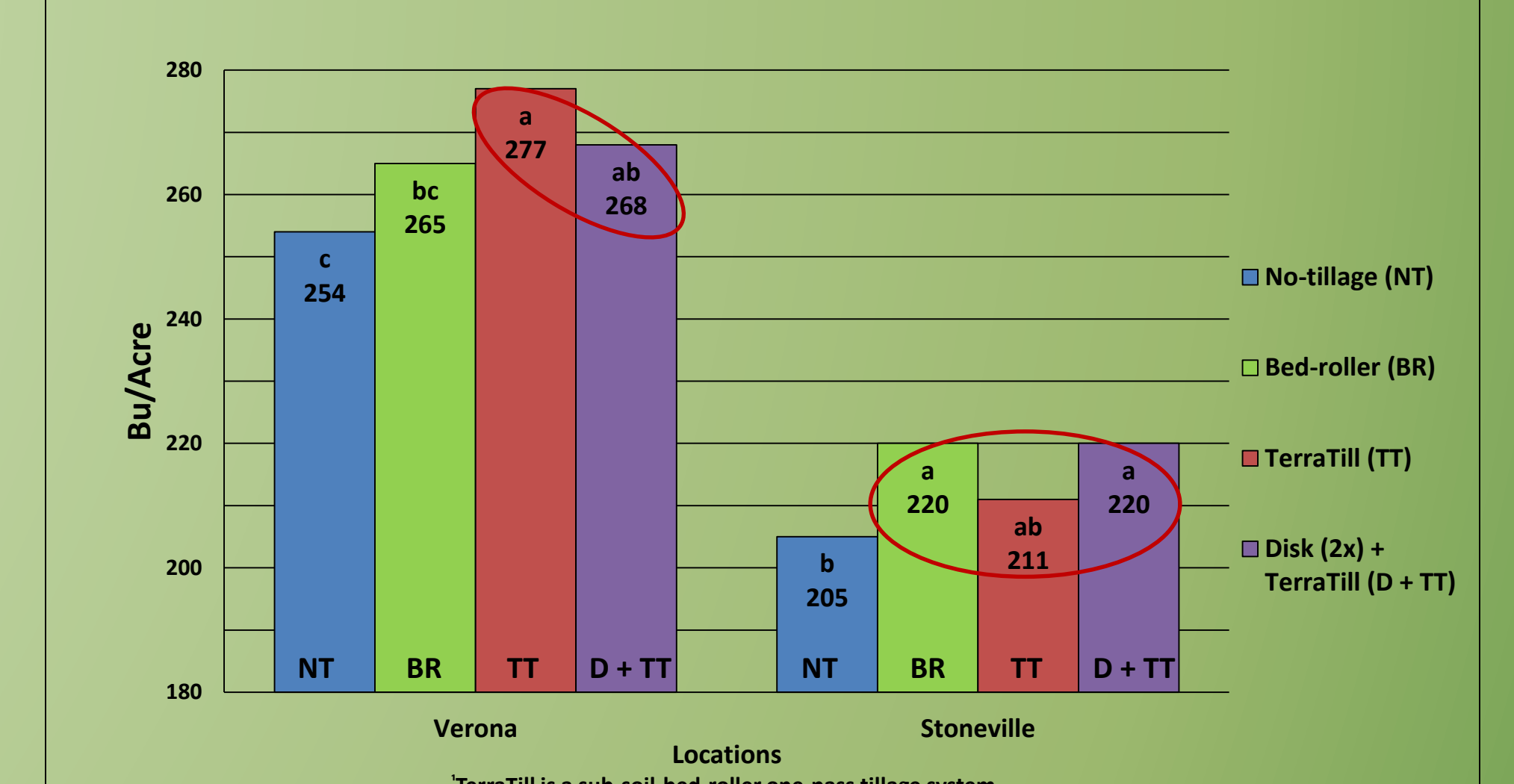


Fig. 3. 2014 Corn Yield at Verona and Stoneville, MS.



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